GarrettCom™

Ethernet at Its Best™

Magnum CS14 and CSN14 Converter Switches

100Mb Fiber

10 Mb Fiber

Installation and User Guide

Magnum™ CS14 and CSN14 Series Converter Switch Installation and User Guide

Part #: 84-00101 Rev. A

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This equipment generates, uses and can radiate frequency energy and if not installed and used properly, that is in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference.

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Revisions

Rev A 02/06: Change address to Westinghouse Drive
Rev A 05/05: Minor updates on Auto-cross (MDIX) functionality
Rev A 10/04: Minor updates on power supply option.
Rev A 09/04: Minor updates on UL requirements, and edit.
Rev A 07/04: Minor updates on Agency approvals and power supplies
Rev A 05/04: Initial release of this user manual for CS14 Converter Switches

GarrettCom, Inc. reserves the right to change specifications, performance characteristics and/or model offerings without notice.

1.0 SPECIFICATIONS

1.1 Technical Specifications

Ports Performance

When a port is operating at 100Mbps:
Data Rate: 100Mbps
When a port is operating at 10 Mbps:
Data Rate: 10 Mbps

Network Standards

100Mb: Ethernet IEEE 802.3u, 100BASE-TX, 100BASE-FX
10 Mb: Ethernet IEEE 802.3, 10BASE-T
Auto-sensing for speed: IEEE 802.3u

Packet-Processing Between Domains

Filter and Forward Rate from 100Mbps ports: 148,800 pps max
Filtering and Forwarding Rate from 10 Mbps ports: 14,880 pps max.
Processing type: Store and Forward, non-blocking
Auto-learning: 2K address table

Address buffer age-out time: 300 sec.
Packet buffers memory: 128KB, dynamically shared on all domains
Latency (not including packet time): 100 to 10 Mbps: 5µs
10 to 100Mbps: 15µs

Path Delay Value: 50 BT on all ports

Maximum Ethernet Segment (or Domain) Lengths

10BASE-T (Unshielded twisted pair)	- 100 m (328 ft)
100BASE-TX (CAT 5 UTP)	- 100 m (328 ft)
100BASE-FX, half-duplex: (multi-mode)	- 412 m (1350 ft)
100BASE-FX, full-duplex: (multi-mode)	- 2 km (6,562 ft)
100BASE-FX, half-duplex: (single-mode)	- 412 m (1350 ft)
100BASE-FX, full-duplex: (single-mode)	- 20 km (65,620 ft)
100BASE-FX, full-duplex: (single-mode, long reach)	- 40 km (131,240 ft)
10BASE-FL, Fiber optic	- 2 km (6,562 ft)
10BASE-FL, Single-mode Fiber optic	- 10 km (32,810ft)

Operating Environment

CS14, CSN14: 32°F to 104°F (0°C to 40°C)

CS14H, CSN14H: -13°F to 140°F (-25°C to 60°C) Long term per agency tests (UL).
-40°F to 149°F (-40°C to 85°C) Short term per IEC Type tests.

CS14P, CSN14P: -40°F to 167°F (-40°C to 75°C) Long term per agency tests (UL).
-58°F to 212°F (-50°C to 100°C) Short term per IEC Type tests.

Storage Temperature,

All models: -40°F to 160°F (-40°C to 85°C)

Cold Start:

CS14H, CSN14H to -20ºC

CS14P, CSN14P to -40ºC

Ambient Relative Humidity: 5% to 95% (non-condensing)

Altitude (All models): -200 to 5000ft. (-60 – 15,000 m)

Conformal Coating (optional) for humidity protection

Note: H and P models are designed for NEBS compliance, including, vibration, shock and altitude.

Packaging:

Enclosure: Rugged sheet metal (Steel).
Dimensions of the Switch unit:
3.5 in H x 3.0 in W x 1.0 in D (8.9 cm x 7.6 cm x 2.5 cm)

Weight: all models: 4.6 oz. (130g);
Power supply, –d, and i: 5.9 oz (170g)
–Hd, and Hi: 5.8 oz (165g)
–Pd, and -Pi: 7.9 oz (225g)

Cooling Method:

Convection on the regular model. The hardened (H) factory floor and premium (P) temperature un-controlled location models have closed cases to withstand dirt and use special thermal techniques to transfer heat to the outside of the case for cooling.

POWER SUPPLY

These products are intended to be supplied by a Listed, Direct Plug-In power unit, marked "Class 2", or a Listed ITE Power Supply, marked "LPS", which has suitably rated output voltage (i.e. 9vdc, 12vdc, 24vdc, 48vdc), and suitably rated output current (i.e. 100mA to 500mA).When connected to a 48 V centralized dc source these products shall be provided with a Listed 5 A DC fuse in the supply circuit.

AC POWER SUPPLY (using an external power adapter):

All models have an (8-15)VDC output with 6ft long cord and a 2.5mm center +ve jack. The power supplies are temperature rated to match the Converter Switch ratings.

Office Ratings (0 to 40°C)

North America (-d) models. Input: direct plug-in 95-125vac at 60 Hz.
Output:12vdc, 1Amps

International (-i) models. Input: 240vac at 50Hz with IEC 320 connector for the user supplied AC power cord.
Output:12vdc, 1Amps

Factory Floor (H) Ratings (-25 to 60°C)

North America (-Hd) models. Hardened, factory floor temperature rated. Input: 6ft AC power cord to IEC 320 connector on the 100-240vac 47-63Hz external power adapter.
Output:12vdc, 1.25Amps

International (-Hi) models. Factory floor temperature rated. Input: IEC 320 connector on the 100-240vac 47-63Hz external power adapter. Requires a user supplied power cord
Output:12vdc, 1.25Amps.

Temperature un-controlled Premium(P) Ratings (-40 to 75°C)

North America (-Pd) models. Outdoor temperature rated. Input: 6ft AC power cord to IEC 320 connector on the100-240vac 47-63Hz external power adapter.
Output:12vdc, 2Amps.

International (-Pi) models. Outdoor temperature rated. Input: IEC 320 connector on the 100-240vac 47-63Hz external power adapter. Requires a user supplied power cord.
Output:12vdc, 2Amps.

Direct DC POWER SUPPLY : built-in terminal block for +, -, ground along with 12VDC jack

12V DC internal (range of 8.0 to 15V DC),.

24V DC internal (range of 18 to 36V DC),.

-48V DC internal (range of 36 to 60V DC), , -, ground.

Power Consumption: See Section 3.6.

Note 1: the 8-15V DC jack can be used for dual source DC input using an AC adapter and the DC terminal block. Power supply protection is provided by internal diodes.

Note 2: The Direct DC power floats. The user may ground either "+" or "-" if desired.

Port Connectors:

Two RJ-45 Ports: support 100BASE-TX and 10BASE-T with auto-cross (MDIX). They are shielded 8-pin female connectors for shielded (STP) and unshielded (UTP) Cat 3, 4, 5 cable.

One Fiber optic port: On the CSN14 Series it is 10Base-FL with ST connections and on the CS14 series it is 100Base-FX with a "fiber flavor" choice of multimode SC, ST or MTRJ or single mode SSC, SSCL, SST or SLC connectors.

Switches

Fiber Port # 1 is controlled by an "F – H" switch, provided underneath it.

"F" enables full-duplex mode and "H" enables half-duplex mode.

The default setting is "F" for 100Mb fiber models, "H" for 10Mb fiber models.

LED Indicators (Dual: front and top)

POWER: Steady ON when power applied
10/100: Steady ON for 100Mbps; OFF for 10 Mbps
LK/ACT: Steady ON for LINK (LK) with no traffic, BLINKING indicates port is transmitting / receiving (ACT).
F/H: Steady ON for full-duplex, OFF for half-duplex

Mounting options

Metal mounting clips for panel mounting: included

DIN-Rail mounting option: Model # DIN-RAIL MC2 (see Section 3.4)

Rack-mount option: MC14-TRAY, see http://www.garrettcom.com/mc_tray.htm

Mean Time Between Failure (MTBF) – over15 years, Telcordia (Bellcore) Method

Agency Approvals and Standards Compliance:

UL Listed (UL 60950), cUL, CE, Emissions meets FCC Part 15 Class A.
NEBS L3 and ETSI compliant.

H and P models: IEEE P1613 Env. Std for Electric Power Substations
P models: NEMA TS-2 and TEES for traffic control equipment
P models: designed for UL 2043 above-the-ceiling installation
IEC61850 EMC and Operating Conditions Class C Power Substations

Warranty: Three years, return to factory Made in USA

1.2 Summary of models and descriptions:

Note: The CSN14 model # consists of the base unit type and the power input. Insert S for sgl-mode
The CS14 model # consists of the base unit type, the fiber flavor (ff) and the power input.

CSN14 Models (for 10Mb fiber).

CSN14-d or -i = two 10/100 RJ-45+ one 10Mb ST Fiber port for office and wiring closet, rated (0 to 40°C) using an external AC power supply.

CSN14H-Hd, Hi = Hardened (H), two RJ-45+ one 10Mb Fiber port for factory floor, rated (-25 to 60°C) using a direct DC (8-15VDC) and/or external AC hardened power supply (included).

CSN14H-12VDC = Same as CS14H model, except AC hardened power supply is not included

CSN14H-24VDC = Same as CS14H-12VDC model, except 24VDC power input replaces 12VDC.

CSN14HR-24VDC = Same as CS14H-24VDC model, but includes DIN-RAIL-MC2 mounting option.

CSN14H-48VDC = Same as CS14H-24VDC model, except -48VDC power input replaces 24VDC.

CSN14P-Pd, Pi = Premium (P), two 10/100 RJ-45+ one 10Mb Fiber port for un-controlled (outdoor) rated (-40 to 75°C) using direct DC (8-15VDC) and/or external AC premium power supply (incl.)

CSN14P-12VDC = Same as CS14P-Pd, Pi, except AC Premium Power Supply is not included.

CSN14P-24VDC = Same as CS14P-12VDC model, except 24VDC power input replace 12VDC.

CSN14PR-24VDC = Same as CS14P-24VDC model, but includes DIN-RAIL-MC2 mounting option.

CSN14P-48VDC = Same as CS14P-24VDC model, except -48VDC input replaces 24VDC.

CS14 Models (for 100Mb fiber).

CS14-ff-d or -i = two 10/100 RJ-45+ one 10Mb ST Fiber port for office and wiring closet (0 to 40C) using an external AC power supply.

CS14H-ff-Hd, Hi = Hardened (H), two RJ-45+ one 10Mb Fiber port for factory floor (-25 to 60C) using a direct DC (8-15VDC) and/or external AC hardened power supply (included).

CS14H-ff-12VDC = Same as CS14H model, except AC hardened power supply is not included

CS14H-ff-24VDC = Same as CS14H-12VDC model, except 24VDC power input replaces 12VDC.

CS14HR-ff-24VDC = Same as CS14H-24VDC model, but includes DIN-RAIL-MC2 mounting option.

CS14H-ff-48VDC = Same as CS14H-24VDC model, except -48VDC power input replaces 24VDC.

CS14P-ff-Pd, Pi = Premium (P), two 10/100 RJ-45+ one 10Mb Fiber port for un-controlled(outdoor) (-40 to 75C) using direct DC (8-15VDC) and/or external AC premium power supply (included).

CS14P-ff-12VDC = Same as CS14P-Pd, Pi, except AC Premium Power Supply is not included.

CS14P-ff-24VDC = Same as CS14P-12VDC model, except 24VDC power input replace 12VDC.

CS14PR-ff-24VDC = Same as CS14P-24VDC model, but includes DIN-RAIL-MC2 mounting option.

CS14P-ff-48VDC = Same as CS14P-24VDC model, except -48VDC input replaces 24VDC.

The “ff” field is for selection of the desired “fiber flavor” as listed below.

"SC" = 100Base-FX-SC: multi-mode fiber optic with SC type connector, 2km.
"SSC"= 100Base-FX-SSC: single-mode fiber optic with SC type connector, 20km.
"SSCL"= 100Base-FX-SSCL: single-mode fiber optic with SC type connector, 40km.
"ST" = 100Base-FX-ST: multi-mode fiber optic with ST type connector, 2km.
"SST" = 100Base-FX-ST: single-mode fiber optic with ST type connector, 2km.
"SLC"= 100Base-FX-SLC: single-mode fiber optic with LC type connector, 15km.
"MTRJ"= 100Base-FX-MTRJ: multi-mode fiber optic with MTRJ type connector, 2km.

Accessories

MC14-TRAY = 19" Rack-mount tray for 14-series Switch models, up to 16 units
Other Tray configurations with power supplies and power cabling included - See Section 3.3

DIN-RAIL-MC2 = Metal DIN-Rail mounting bracket for one CS14 and CSN14 Series Switch, See Section 3.4

Conformal Coating (for high humidity and "tropical" applications) - request quote.

2.0 INTRODUCTION

This section describes CS14- and CSN14-Series models, including appearance, features and typical applications.

2.1 Inspecting the Package and the Product

Examine the shipping container for obvious damage prior to installing this product; notify the carrier immediately of any damage which you believe occurred during shipment or delivery. Inspect the contents of this package for any signs of damage and ensure that the items listed below are included.

This package should contain:

1	Magnum CS14- or CSN14-Series Converter Switch unit,
1	External Power Supply, (for -d, -i, -Hd, -Hi, -Pd and -Pi models only)
1 set	Metal panel mounting clips and screws (2 each)
1	User Guide (this manual)

Remove the Magnum CS14 or CSN14 Series Converter Switch from the shipping container. Be sure to keep the shipping container should you need to ship the unit at a later date. In the event there are items missing or damaged contact your supplier. If you need to return the unit, use the original shipping container. Refer to Section 5 Troubleshooting, for specific return procedures.

2.2 Product Description

Combine a 10 or 100 Mb Fiber Media Converter and a two-port 10/100 copper Switch, and you have the Converter Switch, a flexible edge-of-the-network Ethernet product. Add in fiber port choices for all multi-mode and single-mode fiber connector types plus AC or DC input power selection and multiple application environments, and you have the Magnum CS14 and CSN14 Converter Switch family.

The Magnum CS14 and CSN14 family of Converter Switches with a 100 Mb or 10Mb Fiber port built in covers the full range of application environments, with regular (office), Hardened (factory floor), and Premium-rated (outdoor) versions. Extra features for

heavy-duty and extended temperature operation ranges are included selectively in the Hardened factory-floor and Premium-rated outdoor models. This selection of models and fiber port types offers the best price-to-value ratio for each user and installation. Where a Media Converter might have been used, a Converter Switch offers a better value. The compact package is ideal for network edge installations, and is able to be conveniently mounted to suit any application.

The Magnum CS14 and CSN14 regular-package units are for office and indoor wiring closet environments. These are the economical base units in the CS14 and CSN14 Switch family. An external AC power supply for either North America (-d, 115vac 60Hz) or international (-I, 230vac, 50Hz) is included. The ambient temperature rating is 0°C to 40°C, office grade. A robust metal case with convection cooling is featured. Metal mounting clips are included, and rack-mount tray options are available.

The Magnum CS14H and CSN14H Hardened units are for factory floor applications. The CS14H and CSN14H models are built with high-grade components and are constructed using special thermal techniques and a metal case for heavy duty industrial jobs. In addition to a Hardened AC power option and jack, terminals for internal DC power choices at 8 to15V, 24V or -48V DC are included. The ambient temperature rating of –25 to 60C is for industrial use. No internal air flow is required for cooling, so it resists dust, dirt, moisture, smoke and insects. Mounting options include stand-alone panel-mounting, DIN-Rail, or rack-mount tray.

The Magnum CS14P and CSN14P Premium-rated units are for temperature un-controlled applications (-40 to 75C), typically located outdoors. The CS14P and CSN14P models are built with premium-grade extended temperature components, and use similar thermal techniques as the CS14H Hardened units. In addition to a Premium-rated AC

power option and jack, terminals for internal DC power choices at 8 to15V, 24V or -48V DC are included. When used outdoors, the CS14P should be protected from falling rain. Mounting options include stand-alone panel-mounting, DIN-rail, or rack-mount tray.

The CSN14 series provides switching between two 10/100 auto-negotiating copper ports and one 10Mb ST fiber port and the CS14 series provides switching between two 10/100 auto-negotiating copper ports and one 100Mb fiber port which may be SC, ST, MTRJ or LC multi-mode or single-mode. The plug-and-play, energy-efficient, and flavor rich fiber features make this sleek multi-purpose Switch convenient and cost-effective for the user. The selection of various temperature ranges enable easy deployment in various environments and qualify the Converter Switch as a flexible option, which provides multiple solutions using very small space. Providing the combination of Media Converter with Switch, the CS14 and CSN14 Series is an ideal choice for edge-of–the-network applications.

The YELLOW labeled Magnum CS14 and CSN14 models (as shown in Fig 2.2.a) units are for office and wiring closet environments and use an external AC power supply. A ventilated metal case for convection cooling is featured. Ambient operating temperature is 0° to 40°C. Storage temperature rating is -40°to 85°C. Metal clips are included for secure panel mounting.

Fig 2.2a

CS14 with 100Mb ST connector

The ORANGE labeled Magnum CS14H and CSN14H hardened units (as shown in Fig 2.2b) are designed for factory floor/Industrial applications. Using special thermal techniques and a sealed rugged metal case for heavy duty industrial applications no air inflow is required for cooling, so the CS14H and CSN14H resist dust, dirt, moisture, smoke and insects. Choices of models for external AC or internal DC power are available. Ambient operating temperature is –25°C to + 60°C depending on the power source used. Storage temperature rating is –25°C to + 85°C

Fig 2.2.b

CS14H with 100Mb SC connector

The RED labeled Magnum CS14P and CSN14P series (as shown in Fig. 2.2c) are premium rated units suitable for temperature un-controlled outdoor applications. Specially designed with premium-grade extended temperature components, the CS14P and CSN14P units use similar thermal techniques to the CS14H hardened units for cooling. Mounting options include panel-mounting, DIN-rail, or rack-mount tray. Choices of models for external AC or internal DC power are available. Ambient operating temperature is between –40°C to +75°C depending on the power source used. Storage temperature rating is between –40°C to +85°C.

Fig 2.2c

CS14P with 100Mb SC Connector

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The front side of the unit has two twisted-pair 10/100Mb switch ports and one 10 or 100Mb fiber port. Both the RJ-45 ports of the CS14 and CSN14 Series Converter switches support auto-cross (MDIX) operation performing the auto-cross function under auto-negotiation mode only. The 10Mb fiber (CSN14 models) are factory configured at Half-duplex, and 100Mb (CS14 models) are factory configured at Full-Duplex.

Two sets of LEDs to indicating the operating status of ports are mounted on the top and front (for extra viewing advantage while rack-mounted). For each port, there are Link and Activity (LK/ACT) LED's on the top indicating that the media cables are connected correctly and showing, by blinking, when there is traffic. The LK/ACT LED's are repeated on the front as LA1 (port 1), LA2 (port 2), and LA3 (port 3). There is a power (PWR) indicator on the front of the unit to validate that the unit is turned ON.

The single fiber port on the CSN14's is multi-mode with an ST connector and , on the CS14's, it is an SC, ST or small form-factor connector (MTRJ multi mode or LC

single-mode). The Full Duplex/Half Duplex ("F- H") manual switch provided underneath the fiber port allows the user to fix the fiber port at Full or Half Duplex mode as required.

The external DC power plug connector and/or "jack" and the internal DC input terminal is provided on the rear of the unit.

2.3 Frame Buffering and Latency

The Magnum CS14 and CSN14 Series Converter Switches are store-and-forward switches. Each frame (or packet) is loaded into the Switch's memory and inspected before forwarding can occur. This technique ensures that all forwarded frames are of a valid length and have the correct CRC, i.e. they are good packets. This eliminates propagation of bad packets, enabling all of the available bandwidth to be used for valid information.

While other switching technologies such as "cut-through" or "express" impose minimal frame latency, they will also permit bad frames to propagate out to the Ethernet segments connected. The "cut-through" technique permits collision fragment frames, which are a result of late collisions, to be forwarded to add to the network traffic. Since there is no way to filter frames with a bad CRC (the entire frame must be present in order for CRC to be calculated), the result of indiscriminate cut-through forwarding is greater traffic congestion, especially at peak activity. Since collisions and bad packets are more likely when traffic is heavy, the result of store-and-forward operation is that more bandwidth is available for good packets when the traffic load is greatest.

To minimize the possibility of dropping frames on congested ports, each Magnum CS14 and CSN14 Series Converter Switch dynamically allocates buffer space from 128Kb memory pool, ensuring that heavily used ports receive very large buffer space for packet storage. (Many other switches have their packet buffer storage space divided

evenly across all ports, resulting in a small, fixed number of packets to be stored per port. When the port buffer fills up, dropped packets result.) This dynamic buffer allocation provides the capability for the maximum resources of the Magnum CS14 and CSN14 Series unit to be applied to all traffic loads, even when the traffic activity is unbalanced across the ports. Since the traffic on an operating network is constantly varying in packet density per port and in aggregate density, the Magnum CS14 and CSN14 Series Converter Switches are constantly adapting internally to provide maximum network performance with the least dropped packets.

When the Switch detects that its free buffer queue space is low, the Switch sends industry standard (full-duplex only) PAUSE packets out to the devices sending packets to cause “flow control”. This tells the sending devices to temporarily stop sending traffic, which allows a traffic catch-up to occur without dropping packets. Then, normal packet buffering and processing resumes. This flow-control sequence occurs in a small fraction of a second and is transparent to an observer. See Section 4.6 for additional details.

Another feature implemented in Magnum CS14 and CSN14 Series Converter Switches is a collision-based flow-control mechanism (when operating at half-duplex only). When the Switch detects that its free buffer queue space is low, the Switch prevents more frames from entering by forcing a collision signal on all receiving half-duplex ports in order to stop incoming traffic.

The latency (the time the frame spends in the Switch before it is sent along or forwarded to its destination) of the CS14 and CSN14 Series Converter Switches varies with the port-speed types. The length of the frame is a variable as it is with all store-and-forward switches. For 10 Mb-to-10 Mb or 10 Mb-to-100Mb or 100Mb-to-10 Mb forwarding, the latency is 15 microseconds plus the packet time at 10 Mb. For 100Mb-to-100Mb forwarding, the latency is 5 microseconds plus the packet time at 100Mb.

2.4 Features and Benefits

- **Full 100Mb or 10 Mb switching services for high performance Ethernet LANs**

  Magnum CS14 and CSN14 Series Switches provide Fast Ethernet switching on all ports. They perform high speed filter/forward operations on the traffic, giving each port's segment a full 100Mb (or 10 Mb) of bandwidth.

- **Reduces Network Costs and provide economical solution**

  Magnum CS14 and CSN14 Series Switches offer the ideal solution to efficiently and inexpensively connect a Twisted Pair and fiber network with 10Mb or 100Mb and help to expand the Ethernet network in a very convenient and economical way.

- **Choice of 10 or 100Mb Fiber option, more efficient than media converter** Designed as a multi-purpose media converter and Switch, the 10 or 100Mb fiber port allows the user to convert the media from copper to fiber and the other RJ-45 port can be used as diagnostic port or for more connectivity.

- **Installation is "Plug and Play", operation is transparent to software**
  The Magnum CS14 and CSN14 Series Switches operate as hardware switches, only forwarding those packets from each domain that are needed on the other domains. Internal address tables are self-learning, enabling users to change port connections or 10/100 domains without affecting operations.
- **Two sets of LEDs for viewing status from any angle.**
  Each CS14 and CSN14 Series Converter Switch is equipped with two sets (front and top) of LEDs to provide status information when viewed at almost any angle or mounting arrangement whether rack (MC14- Tray) or wall-mounted**.**
- **Rugged metal case, Industrial grade**

  CS14 and CSN14 Series have a robust design and are packaged in a rugged sheet metal enclosure to ensure high reliability and durability even when placed in industrial or outdoor applications.

- **Qualified to use for temperature un-controlled "outdoor" application**

The Magnum CS14P and CSN14P Premium rated versions of Converter Switches have an ambient temperature rating between –40C to +75C for DC models and qualify for temperature un-controlled "outdoor" application.

- **Efficient Compact design, for all purpose convenient mounting**

Featuring a compact steel case with an external AC and internal DC power supply, Magnum CS14 and CSN14 Series of Converter Switches can be installed in small spaces in cabinets, on table tops, in racks, wall or DIN rail mounted and in trays such as the Magnum MC14-TRAY.

- **MDIX ports to eliminate cross-over cable while cascading**

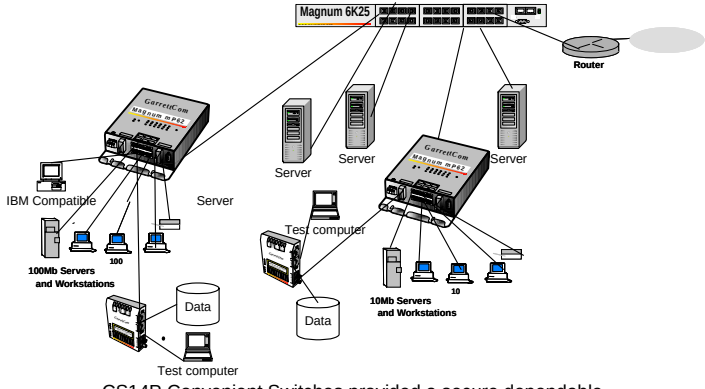
All the Magnum CS14 and CSN14 Series Switches are featured with MDIX (auto-cross), which easily allow cascading with other Switch Hubs or media converters, without using the cross-over cable.

2.5 Applications for CS14 and CSN14 Series Converter Switches

Enriched with the three tier "Y-O-R" hardness rating flavors (Yellow - "office", Orange – "Hardened", Red- "Premium rated (outdoor)"), the multifunctional, multi-media and multi-environmental, Magnum CS14 and CSN14 Series Converter Switches fit very well in almost any environment enabling users to scale their networks quickly and cost effectively. The edge-of-the-network connectivity solutions offered by Magnum Converter Switches are focused on providing easier, more economical and ultra-reliable industrial application products. The compactly designed Magnum CS14 and CSN14 Series act as very useful tools in the modern life of fast expanding network requirements. The Dual-Speed and Dual-media functions support a mixed environment of 10 Mbps and 100Mbps users with copper and fiber media. The switched full / half duplex capability on fiber ports provides high bandwidth performance. The up-link choice of 10 or 100Mb fiber on Port# 1 enables easy

expansion for the on-going demand of Ethernet networks. The 10/100Mbps auto-negotiating copper ports together with the 10 or 100Mbps fiber port choices and the availability of all of the industry standard fiber connectors, enable easy interfacing with existing cable plant and equipment. The Magnum CS14Ps and CSN14Ps fit very well in high temperature locations experiencing a need to scale the LAN quickly and cost effectively. With its half / full duplex switching capability on fiber port # 1, the CS14Ps provide a very economical high bandwidth solution at each cable user access point of copper, and also easily solve long distance requirements. The ruggedness of the CS14P's steel case and the high reliability of the design compliments the temperature controlled packaging to provide an exceptional Ethernet product.

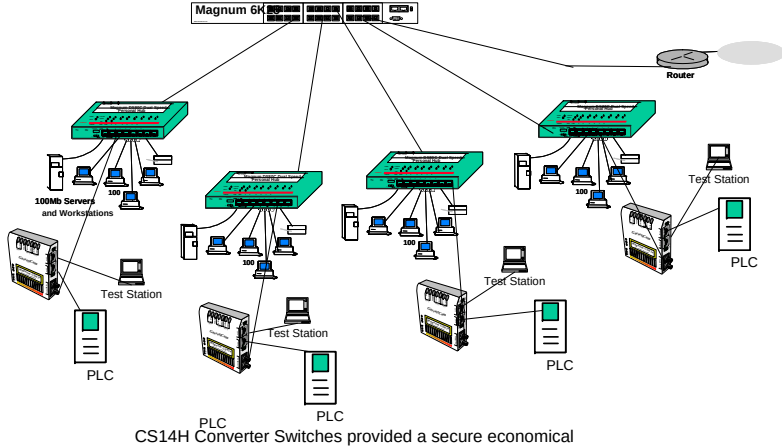
Example1. Indoor Office CS14 or CSN14



CS14P Convenient Switches provided a secure dependable, reliable solution for un-controlled temp. environment

In this example, the indoor office location is a Data Mining function with an ongoing demand to grow the network. This need can be easily met using the economical Magnum CS14 or CSN14 Converter Switch. Additional functionality includes the ability to transfer data across large distances with multi- or single–mode fiber while securing the LAN from EMI and wire tapping.

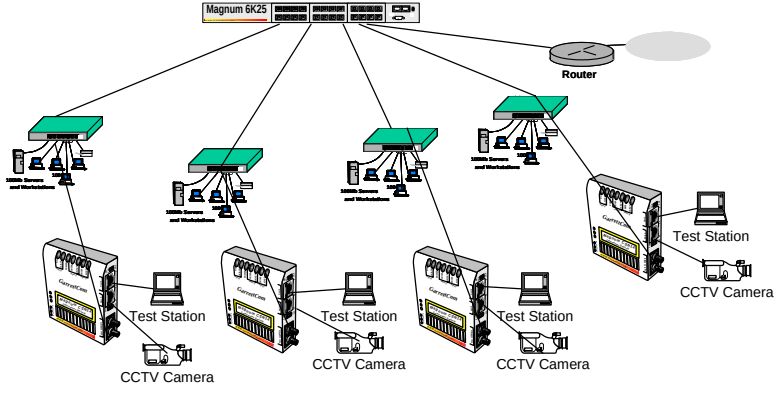
Example 2: CS14H and CSN14H



CS14H Converter Switches provided a secure economical solution for expanding Industrial network

In this application, where in expanding an industrial network environment, the new PLC units are deployed on an existing network and each needs one (or two for redundancy) Ethernet ports to carry status and control data to the control center the hardened version of Magnum CS14H or CSN14H is typically used. . The Fiber port on the converter switches is ideal for secure data communications over long distances that may be encountered in this edge of network application. Built with high-grade components, efficient cooling techniques and having no openings for dirt to enter, the CS14 and CSN14 Series Converter Switches provide the very effective solution for this need.

Example 3: CS14P or CSN14P



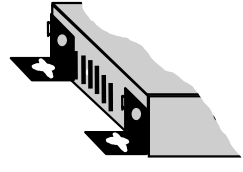
In this example, the Magnum CS14P or CSN14P premium Converter Switches are deployed to serve as a secure corporate or transportation surveillance system. CCTV cameras may be spread out over many miles in temperature un-controlled locations and with pan, tilt and zoom (PTZ) controlled through an Ethernet copper port .The premium Converter Switches are ideally suited to providing copper to fiber media conversion for secure long distance (2-40km) communication while being installed in temperature un-controlled cabinets and allowing a full range of AC and DC power options. The second copper port at the remote location provides access for other Ethernet equipment such as motion detectors or will act as a test port for maintenance personnel with up-link for access to a central LAN and central file servers.

3.0 INSTALLATION

This section describes the installation of the Magnum CS14 and CSN14 Series Converter Switches, including location, mountings, power supply options and media connection.

3.1 Locating the Converter Switch Unit

All the CS14 and CSN14 Series Switches operate in transparent half-and full-duplex mode. The store and forward switch easily takes care of network traffic and can be used as a useful, economical tool to expand an existing network.

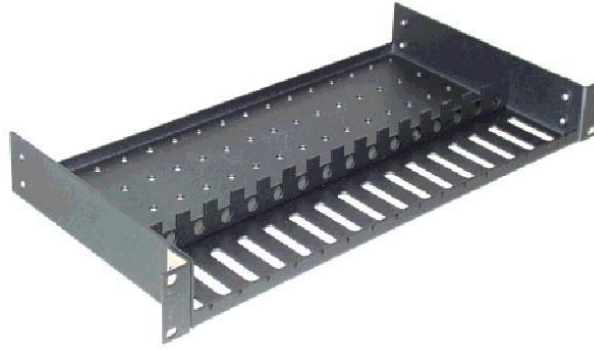


Secure attachment of clips for panel -

The compact and lightweight design of the Magnum CS14 and CSN14 Series allows it to be easily installed in almost any location. A Velcro strip may be used for mounting the unit on a vertical surface such as a wall or cabinet, or for securing the unit on a table-top or shelf. Alternatively, metal mounting clips and screws are included for a rugged and secure mounting in any orientation.

Installation of the Magnum CS14 and CSN14 Series Converter Switches is a simple procedure. The installation location is dependent upon the physical layout of the Ethernet network and associated cabling. Make sure the unit is installed in a location that is easily accessible to an AC power outlet or the appropriate DC source and where cooling is not inhibited. The green Power (PWR) LED must turn ON when power is applied.

3.2 MC14-TRAY for Rack Mounting of CS14 and CSN14 Series Switches



For 19" rack-mounting of Magnum CS14 and CSN14 series Converter Switches, a rack-mount tray is available, the MC14-TRAY. The Converter Switches are mounted with the DC power jack in the back, with the fiber and the RJ-45 connectors in the front. Any mix of the Converter Switches and/or Media Converters may be placed on a tray, up to a maximum of 16 units. (The mounting spaces of the MC14-TRAY are specific to the Magnum products and will not permit other models to be properly mounted).

In a typical installation, the MC14-TRAY, 19" rack-mount tray will hold a few (three to eight) CS14 and CSN14 Series Converter Switches, with their power supplies plugged into power strips (not included) in the rear area of the tray. Metal mounting screws in the bottom-front hold the Converter Switches firmly in place. The beveled-top edge of the units permits the LEDs of each unit to be viewed for operational status, even when the units are very close together.

3.3 MC14-TR+PS9 and MC14-TR+PS9X2 for Rack Mounting Media Converters

The MC14-TR+ PS9 and MC14-TR+PS9X2 are other options for rack mounting the mix of Magnum 10Mbps and 100Mbps Converter Switches and Media Converters together in a 19" rack-mount tray. These models come with built-in common universal AC power supply rated at 55 watts at 50°C ambient, 12VDC output, and supporting up to 10 Switches for MC14-TR+PS9 and 16 units CS14 and CSN14 Series for MC14-TR+PS9X2. The MC14-

TR+PS9X2 Model has two groups of eight units per power supply. The power supplies have auto-ranging AC input for use worldwide.

The side-view below is an example of an installation of the model MC14-TR+PS9, 19" rack-mount tray, holding a few CS14 and CSN14, FT14 and 14E Media Converters, each with their power input plugged into the built-in common AC power supply in the rear area of the tray. (PS units that come with the MC's are not used).

Metal mounting screws in the bottom-front hold each of the media converters securing them in the tray and enabling separate removal for service. The dual LEDs permit viewing of Switch status from any angle.

3.4 DIN-Rail mounting option

The Magnum CS14HR, CSN14HR and CS14PR, CSN14PR Converter Switches, designed for use in "Factory Floor" Industrial Ethernet environments, are also available for DIN-Rail mounting in an enclosure having DIN Rails.

A Magnum CS14H is shown alongside the DIN-Rail-MC2 bracket

The metal DIN-Rail mounting hardware is optional and needs to be ordered as a separate item, e.g. Model #DIN-RAIL-MC2.

It comes with four screws to attach the bracket to the MC unit. The rail clip is spring-loaded with a pull-up latch at the top for easy "snap-on" attachment and removal.

The Magnum CS14 and CSN14 models with “HR” have 24VDC power, and have the DIN-Rail-MC2 bracket included and assembled with the MC unit at the factory.

3.5 Power Requirements, Power Supply Types for CS14 and CSN14 Series Switches

Magnum CS14 and CSN14 Series Switches are power-efficient and can work with an external AC power supply. Magnum CS14 and CSN14 Series require a nominal 12VDC input version. The extended temperature (H and P) versions are used for heavy duty industrial applications.

The 12V DC power input has a plug of 2.5mm, center +ve , with 6 ft. cord. All the AC power supply info detail is provided in Technical Specifications Section 1.1.

The CS14 and CSN14 Series are designed to be used with UL listed Class II power supplies. The CS14P/S14H converter switches provide reliable operation, withstand

higher temperature environments, and provide the DC power choices to the user to deploy in uncontrolled temperature environments.

12VDC **24VDC** **-48VDC**

The Direct DC (Internal) 12V DC (8 – 15V DC) has a built-in terminal block for +, -, ground. The 9V DC jack is also present. Detail information about the 12 VDC, the 24V DC and the –48V DC is provided in the Technical Specifications Section 1.1.

The various models of DC power type and extended ambient temperature power supplies are numerous and your choice needs to be called out on your order.

Note: When connected to a -48 V centralized dc source these products are to be installed only in Restricted Access Areas (dedicated equipment rooms, electrical closets or the like).

3.6 Powering the CS14H, CSN14H and CS14P, CSN14P (DC internal) with 12V, 24V or –48VDC power input

Each Magnum CS14H/CS14P-Series is reliably equipped with an internal DC power supply, and has built-in screw terminals for secure attachment of the power leads. Three models support a range of power input types. The three model choices are for use with 12VDC, 24VDC or -48VDC power. DC power input may be chosen for high-availability.

The extended temperature capability of the DC-powered CS14P's can go temperature uncontrolled environments, rated at –40`C to +75`C. If indoors, the DC jack is also present and optionally can be used with an external AC power supply.

DC Power Terminals: "+", "-", gnd

GND: Terminal for "earth" or ground wire connection to the CS14H chassis

Input Voltage: 8 - 15V DC (12V DC)

18 – 36V DC (24V DC)

36 – 60V DC (-48V DC)

Input current: 0.8 amp.(12V DC)

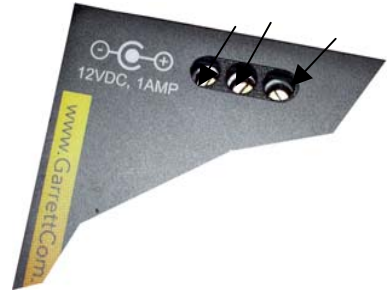
0.4 amp max.(24V DC)

0.2 amp max.(-48V DC)

Power Consumption: 4.8 watts typical, 6 watts maxm.

3.7 CS14H and P Series , DC-powered, -48VDC, 24VDC and 12VDC Installation

This section describes the proper connection of the -48VDC leads (or 24VDC, 12VDC leads) to the DC power terminal block on the Magnum CS14H hardened media converter (as shown in Figure). The DC terminal block on the Magnum CS14H is located on the left side of the unit and is equipped with three (3) screw-down lead posts. The power terminals are identified as positive (+) and negative (-), and they are floating inside the unit so that either of the terminal may be grounded by the user if desired. The chassis is "earth" or ground (GND).



The connection procedure is straightforward. Simply insert the DC leads to the CS14H's power terminals, positive (+) and negative (-) screws. The use of Ground (GND)

optional; it connects to the CS14H chassis. Ensure that each lead is securely tightened from the top, as shown here.

NOTE: Always use a voltmeter to measure the voltage of the incoming power supply and figure out the +ve potential lead or -ve potential lead. The more +ve potential lead will connect to the post labeled "+ve" and the rest to the "-ve".

The GND can be hooked up at the last.

When power is applied, the green PWR LED will illuminate.

3.8 Connecting Ethernet Media

The Magnum CS14 and CSN14 Series Converter Switch can be connected to two media types i.e. fiber and copper (RJ-45) types, runt at 100BASE-TX, 10BASE-T and 100BASE-FX, or 10BASE-FL. CAT 5 cables should be used when making 100BASE-TX connections. When the ports are used as 10BASE-T ports, CAT 3 may be used. In either case, the maximum distance for unshielded twisted pair cabling is 100 meters (328 ft). For

fiber port 10BASE-FL or 100BASE-FX multi-mode, 50/125 or 62.5/125 microns cabling can be used, whereas for single-mode, 9/125 microns cabling should be used. Fiber cabling supports much longer cable distance and higher bandwidths as compared to copper wiring.

Media	IEEE Standard	Connector
Twisted Pair (CAT 3 or 5)	10BASE-T	RJ-45
Twisted Pair (CAT 5)	100BASE-TX	RJ-45
Fiber (Multi-mode, Single -mode)	10BASE-FL	ST
Fiber (Multi-mode)	100BASE-FX	ST, SC
Fiber (Single-mode)	100BASE-FX	SC, LC
Fiber (Multi-mode)	100BASE-FX	MTRJ

NOTE : *It is recommended that high quality CAT. 5 cables (which work for both 10 Mbps and 100Mbps) be used whenever possible in order to provide flexibility in a mixed-speed network, since P80-series switch ports are auto-sensing for either 10 and 100Mbps. Note that the auto-cross function does not operate, if the port is fixed or not supporting auto-negotiation.*

3.8.1 Connecting Twisted Pair (RJ-45, CAT 3 or CAT 5, Unshielded or Shielded)

The following procedure describes how to connect a 10BASE-T or 100BASE-TX twisted pair segment to the RJ-45 port. The procedure is the same for both unshielded and shielded twisted pair cables.

1. Using standard twisted pair media, insert either end of the cable with a RJ-45 plug into the RJ-45 connector of the port. Note that, even though the connector is shielded, either unshielded or shielded cables and wiring may be used.
2. Connect the other end of the cable to the corresponding device.
3. Use the LINK LED to ensure proper connectivity by noting that the LED will be illuminated when the unit is powered and proper connection is established. If this does not help, ensure that the cable is connected properly and that the device on the other end is powered and is not defective.
4. For Port # 1 or 1SW, if the LINK LED is not illuminated, move the switch which has a cross-over or up-link for linking to another hub or Switch.

3.8.2 Connecting Fiber Optic ST-type, "twist-lock"

The following procedure applies to installations using ST-type fiber connectors. This procedure applies to ports using multi-mode ST fiber connectors.

1. Before connecting the fiber optic cable, remove the protective dust caps from the tips of the fiber connectors. Save these dust caps for future use.
2. Wipe clean the ends of the dual connectors with a soft cloth or lint-free lens tissue dampened in alcohol. Make certain the connectors are clean before connecting.

   Note: ***One strand of the duplex fiber optic cable is coded using color bands at regular intervals; you must use the color-coded strand on the associated ports at each end of the fiber optic segment.***
3. Connect the Transmit (TX) port (light colored post) on the Magnum Fiber port to the Receive (RX) port of the remote device. Begin with the color-coded strand of the cable for this first TX-to-RX connection.
4. Connect the Receive (RX) port (dark colored post) to the Transmit (TX) port of the remote device. Use the non-color coded fiber strand for this.
5. The LINK LED on the front of the fiber connector will illuminate when a proper connection has been established at both ends (and when power is ON in the unit). If

LINK is not lit after cable connection, the normal cause is improper cable polarity. Swap the fiber cables at the fiber connector to remedy this situation.

3.8.3 Connecting Fiber Optic SC-type, "Snap-In"

The following procedure applies to installations using SC-type fiber connectors, i.e., using multi-mode SC and SC single-mode. While connecting fiber media to SC connectors, simply snap on the two square male connectors into the SC female jacks of the Fiber connector until it clicks and secures.

3.8.4 Connecting Single-Mode Fiber Optic

When using single-mode fiber cable, be sure to use single-mode fiber port connectors. Single-mode fiber cable has a smaller diameter than multi-mode fiber cable (9/125 microns for single-mode, 50/125 or 62.5/125 microns for multi-mode where xx/xx are the diameters of the core and the core plus the cladding respectively). Single-mode fiber allows full bandwidth at longer distances, about 20Km with the multi-mode SC.

The same procedures as for multi-mode fiber apply to single-mode fiber connectors. Follow the steps listed in Section 3.8.2 above.

3.8.5 Power Budget Calculations for CS14 and CSN14 Series, Fiber Media

Receiver Sensitivity and Transmitter Power are the parameters necessary to compute the power budget. To calculate the power budget of different fiber media installations using Magnum products, the following equations should be used:

OPB (Optical Power Budget) = P_T(min) - P_R(min)

where P_T = Transmitter Output Power, and P_R = Receiver Sensitivity

Worst case OPB = OPB - 1dB(for LED aging) - 1dB(for insertion loss)

Worst case distance = {Worst case OPB, in dB} / [Cable Loss, in dB/Km]

where the "Cable Loss" for 62.5/125 and 50/125μm (m.m.) is 2.8 dB/km,
and the "Cable Loss" for 100/140 (Multi-mode) is 3.3 dB/km,
and the "Cable Loss" for 9/125 (Single-mode) is 0.5 dB/km

The following data has been collected from component manufacturer's (HP's, and Siemens') web sites and catalogs to provide guidance to network designers and installers

Fiber Port Module	Speed, Std.	Mode	Std. km fdx (hdx)	Wavelength nm	Cable Size µm	X'mitr Output P_T, dB	R'cvr Sens. P_R,dB	Worst OPB, dB	Worst* distance Km, fdx	typical OPB, dB	typical* distance Km, fdx
CS14-MST, MSC	**100Mb FX**	Multi-mode	2 (0.4)	1300	62.5/125 50/125	-20 -23.5	-31 -31	9.0 5.5	2.5 2.0	14 12	5 4
CS14-SSC	**100Mb FX**	Single-mode	20 (0.4)	1300	9/125	-15	-31	14	28	17.5	35
CS14-MTRJ	**100Mb FX**	Multi-mode	2 (0.4)	1300	62.5/125 50/125	-20 -23.5	-31 -31	9.0 5.5	3.0 2.0	15.8 12.2	5.5 4.0
Long Reach	**100Mb FX**	Single-mode	40 (0.4)	1300	9/125	-5	-34	27	54	32.5	65
CSN14-MST	**10 Mb FL**	Multi-mode	**2 (2)**	850	62.5/125 100/140 50/125	-15.0 -9.5 -19.5	-31 -31 -31	14 19.5 9.5	**5** **5.9** **3.4**	17 23.5 13.5	**6** **7** **4.8**
CSN14-single-mode	**10 Mb FL**	Single-mode	**10 (5)**	1300	9/125	-30	-39	7	**14**	13	**26**

**** Note:*** *The use of either multi-mode or single-mode fiber to operate at 100Mbps speed over long distances (i.e., over approx. 400 meters) can be achieved* **only** *if the following factors are both applied:*

- *The 100Mb fiber segment must operate in full-duplex (FDX) mode, and*
- *The worst-case OPB of the fiber link must be greater than the fiber cable's passive Attenuation.*

(Attenuation = Cable loss + LED aging loss + Insertion loss + safety factor)

3.8.6 Connections to NICs which support Auto-Negotiation, RJ-45 ports

The copper ports of Magnum CS14-Sereis Converter Switches will function properly with NICs (Network Interface Cards) which support Auto-Negotiation, and the Fast Link Pulse (FLP) coding for the 100BASE-TX signaling system. When connecting a NIC to the CS14-Series, it may be necessary to reload the NIC drivers on the user device if the NIC has been communicating with a protocol other than 100BASE-TX (such as 10BASE-T). When 100Mb operation is agreed and in use, the 10/100 LED is illuminated steady ON and is OFF, if 10 Mbps traffic.

4.0 OPERATION

4.1 Dual-Speed Functionality, and Switching

The Magnum CS14 and CSN14 Series Converter Switches provide four switched ports (three ports in the front and one on the rear). The architecture supports a dual speed switching environment, with standard auto-negotiation capability.

The switched RJ-45 ports are full- or half-duplex auto-sensing for mode and speed, and auto-cross for plug polarity. (See Section 2.2). When the connected device is 10 Mbps, the CS14s obeys all the rules of 10 Mbps Ethernet configurations. The 10 Mbps users can "communicate" with 100Mbps users as well as other 10 Mbps users through the switch. Similarly, the 100Mbps traffic obeys the rules of 100Mbps Ethernet, and can communicate with 10 Mb and 100Mb users.

Magnum CS14 and CSN14 Series units are plug-and-play devices. There is no software configuring to be done at installation or for maintenance. The only hardware

configuration settings is user options for port #2, to configure it FF/AN. The internal functions of both are described below.

Switching, Filtering and Forwarding

Each time a packet arrives on one of the switched ports, the decision is taken to either filter or to forward the packet. Packets whose source and destination addresses on the same port segment will be filtered, constraining them to one port and relieving the rest of the network from processing them. A packet whose destination address is on another port segment will be forwarded to the appropriate port, and will not be sent to the other ports where it is not needed. Packets needed for maintaining the operation of the network (such as occasional multi-cast packets) are forwarded to all ports. The Magnum CS14 and CSN14 Series Converter Switches operate in the store-and-forward switching mode, which

eliminates bad packets and enables peak performance to be achieved when there is heavy traffic on the network.

Switching, Address Learning

The Magnum CS14 and CSN14 Series units have address table capacity of 2K node addresses, and are suitable for use in large networks. They are self-learning, so that as nodes are added or removed or moved from one segment to another, the CS14- and CSN14-Series switch automatically keeps up with node locations.

An address-aging algorithm causes least-used addresses to fall out in favor of new frequently-used addresses. To reset the address buffer, cycle power down-and-up.

4.2 Auto-cross (MDIX), Auto-negotiation and Speed-sensing

The RJ-45 ports support auto-cross (MDI or MDIX) in the auto-negotiation mode according to the IEEE 802.3u standard. No crossover cables are needed when connecting the CS14's to other unmanaged switches, legacy hubs, managed switches,

media-converters etc. Please note that there can be conditions with managed switches where the switch manager fixes the port settings via software, and the result of the auto-negotiation is changed in the managed switch by the manager commands. In such cases, the 10/100 speed or the F/H mode may be affected, but auto-cross in the CS14 Switches will still work. The auto-cross function cannot be disabled.

When an RJ-45 cable connection is made, and each time LINK is enabled, auto-negotiation takes place (except for legacy products, which do not have auto-negotiation and which go to the default state accordingly). The Magnum Switch advertises its capability for 10 or 100 Mbps speed and F/H duplex mode, and the device at the other end of the cable should similarly advertise / respond. Both sides will agree to the speed and mode to be used per the IEEE 802.3u standard. Depending upon the devices connected, this will result in agreement to operate at either 10 Mbps or 100Mbps speed, and full- or half-duplex mode.

4.3 (F- H) Switch, Full-Duplex or Half-Duplex options for Fiber port# 1

The (F–H) manual switch has been provided for fiber port #1, for fixing that port at Full or Half Duplex as per the requirements. The (F-H) manual switch is being

located underneath the fiber port. The Fiber port with 10Mb is being set at Half-Duplex, and the 100Mb being set at Full-Duplex as default from the factory. The port can be set at the required mode, by sliding the manual switch position to “F” or “H”.

4.4 Dual LEDs, Front-panel and side-panel (Magnum CS14 and CSN14)

LED	Description
PWR	Illuminates GREEN to indicate power applied.
LK/ ACT	Steady ON for LINK w/no traffic, blinking for activity per port. LINK will turn off in the event connectivity is lost between the ends of the twisted pair segment or a loss of power occurs in the unit or remote device. The Link ports are also represented by LA1, LA2, LA3. (Steady On or steady Off indicates no Receive Activity).
10/100	Steady ON for 100Mb speed, OFF for 10Mb speed per port
F/H	Steady ON for Full duplex mode, OFF for half duplex per port

5.0 TROUBLESHOOTING

All Magnum Ethernet products are designed to provide reliability and consistently high performance in all network environments. The installation of Magnum CS14 and CSN14 Series 10/100 Mb/s Switches is a straightforward procedure (see INSTALLATION, Section 3.0); the operation is also straightforward and is discussed in Section 4.

Should problems develop during installation or operation, this section is intended to help locate, identify and correct these types of problems. Please follow the suggestions listed below prior to contacting your supplier. However, if you are unsure of the procedures described in this section or if the Magnum CS14 and CSN14 Series 10/100 Mb/s Switch is not performing as expected, do not attempt to repair the unit; instead contact your supplier for assistance or contact GarrettCom Customer Support.

5.1 Before Calling for Assistance

1. If difficulty is encountered when installing or operating the unit, refer back to the Installation Section of the applicable chapter of this manual. Also check to make sure that the various components of the network are interoperable.

2. Check the cables and connectors to ensure that they have been properly connected and the cables/wires have not been crimped or in some way impaired during installation. (About 90% of network downtime can be attributed to wiring and connector problems.)

3. Make sure that an AC power cord is properly attached to each Magnum CS14 and CSN14 Series unit. Be certain that the AC power cord is plugged into a functioning electrical outlet. Use the PWR LEDs to verify each unit is

receiving power.

4. If the problem is isolated to a network device other than the Magnum CS14 and CSN14 Series 10/100 Mb/s switch product, it is recommended that the problem device is replaced with a known good device. Verify whether or not the problem is corrected. If not, go to Step 5 below. If the problem is corrected, the Magnum CS14 and CSN14 Series Switch and its associated cables are functioning properly.

5. If the problem continues after completing Step 4 above, contact your supplier of the Magnum CS14 and CSN14 Series 10/100 Mb/s Switch unit or if unknown, contact GarrettCom, Inc by fax, phone or email (*support@garrettcom.com*) for assistance.

5.2 When Calling for Assistance

Please be prepared to provide the following information.

1. A complete description of the problem, including the following points:

   a. The nature and duration of the problem;
   b. Situations when the problem occurs;
   c. The components involved in the problem;
   d. Any particular application that, when used, appears to create the problem;

2. An accurate list of GarrettCom product model(s)involved, with serial number(s). Include the date(s) that you purchased the products from your supplier.

3. It is useful to include other network equipment models and related hardware, including Convenient computers, workstations, terminals and printers; plus, the various network media types being used.

4. A record of changes that have been made to your network configuration prior

to the occurrence of the problem. Any changes to system administration procedures should all be noted in this record.

5.3 Return Material Authorization (RMA) Procedure

All returns for repair must be accompanied by a Return Material Authorization (RMA) number. To obtain an RMA number, please use this URL - **https://rma.garrettcom.com/rma/rma_request_noaccount.php** to fill out the form. Please have the following information readily available:

Name and phone number of your contact person.
Name of your company / institution
Your shipping address
Product name
Serial Number (or Invoice Number)
Packing List Number (or Sales Order Number)
Date of installation
Failure symptoms, including a full description of the problem.

GarrettCom will carefully test and evaluate all returned products, will repair products that are under warranty at no charge, and will return the warranty-repaired units to the sender with shipping charges prepaid (see Warranty Information, Appendix A, for complete details). However, if the problem or condition causing the return cannot be duplicated by GarrettCom, the unit will be returned as:

No Problem Found.

GarrettCom reserves the right to charge for the testing of non-defective units under warranty. Testing and repair of product that is not under warranty will result in a customer (user) charge.

5.4 Shipping and Packaging Information

Should you need to ship the unit back to GarrettCom, please follow these instructions:

1. Package the unit carefully. It is recommended that you use the original container if available. Units should be wrapped in a "bubble-wrap" plastic sheet or bag for shipping protection. (You may retain all connectors and this Installation Guide.)

CAUTION: Do not pack the unit in Styrofoam "popcorn" type packing material. This material may cause electro-static shock damage to the unit.

2. Clearly mark the Return Material Authorization (RMA) number on the outside of the shipping container.
3. GarrettCom is not responsible for your return shipping charges.
4. Ship the package to:

GarrettCom, Inc.
47823 Westinghouse Drive
Fremont, CA 94539

Attn.: Customer Service

APPENDIX A: WARRANTY INFORMATION

GarrettCom, Inc. warrants its products to be free from defects in materials and workmanship for a period of three (3) years from the date of shipment by GarrettCom. During this warranty period, GarrettCom will repair or, at its option, replace components in the products that prove to be defective at no charge other than shipping and handling, provided that the product is returned pre-paid to GarrettCom.

This warranty will not be effective if, in the opinion of GarrettCom, the product has been damaged by misuse, misapplication, or as a result of service or modification other than by GarrettCom. GarrettCom reserves the right to make a charge for handling and inspecting any product returned for warranty repair which turns out not to be faulty.

Please complete the warranty card as this acts as a product registration, and mail it to GarrettCom within two weeks of your purchase.